EDUCATION IN CIVIL ENGINEERING

DOI 10.15826/rjcst.2017.1.010 УДК 69.032.4(084)

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AN INTEGRATED APPROACH FOR THE IMPLEMENTATION OF MASTER'S PROGRAMS IN THE FIELD OF ENERGY EFFICIENCY IN THE FRAMEWORK OF THE MARUEEB PROJECT

Abstract. The present paper introduces the main aim of the MARUEEB project. MARUEEB project is framed within the Erasmus+ KA2 program and it is aimed at creating master courses on the topic of energy efficiency in buildings in Russian and Armenian Universities with the support of EU universities. Stakeholders are also involved in the project in order to establish a link between the universities and the business and social context of the different locations where the master courses will be implemented. The master programs will be developed in the field of civil engineering and architecture and a strong emphasis on the learning outcome structure is be also placed, in order to guarantee the implementation of an up to date process for the designing of study programs.

Keywords: energy efficiency, buildings, learning outcomes, Bologna Process.

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КОМПЛЕКСНЫЙ ПОДХОД К РЕАЛИЗАЦИИ МАГИСТЕРСКИХ ПРОГРАММ В СФЕРЕ ЭНЕРГОЭФФЕКТИВНОСТИ В РАМКАХ МЕЖДУНАРОДНОГО ПРОЕКТА MARUEEB

Аннотация. Настоящая статья представляет главную цель проекта MARUEEB. Проект MARUEEB реализуется в рамках программ Erasmus+ KA2 и нацелен на создание магистерских программ в сфере строительства энергоэффективных зданий в российских и армянских университетах при поддержке университетов ЕС. Партнеры проекта — работодатели — также участвуют в проекте, чтобы установить связь между университетами, бизнесом и социальной средой в различных регионах, где будут осуществляться магистерские программы. Магистерские программы будут разрабатываться в области строительства и архитектуры. Особое внимание будет уделено структуре результатов обучения, чтобы гарантировать реализацию постоянно обновляемого процесса разработки учебных программ.

Ключевые слова: энергоэффективность, строительство, результаты обучения, Болонский процесс.

1. Introduction

Buildings are responsible for about 40 % of the total energy consumption in Europe, with a major share, ~25 %, due to households, which represent the largest sector in all end-users area. More in detail, energy in households is consumed for different purposes — such as hot water, cooking and appliances — but the dominant end-use is represented by space heating, which is generally responsible for about 70 % of total energy consumption in households. Most of this energy is obtained from fossil fuel resources, therefore its consumption causes relevant pollutant emissions.

Usually, a relevant share of this consumption could be avoided by implementing energy efficiency and conservation measures. To this aim EU launched a

program with the aim to enhance energy efficiency of 20 % by 2020. Different studies [1] confirmed that this target is achievable, but in some cases financial incentives could be necessary.

Energy efficiency became a topic of relevant interest for the policy makers in 1973, when there was the first oil crisis. In that period many countries realized that their development policies were linked to the decisions taken in the oil supply countries, therefore they understood that the simplest way to decrease their degree of dependence was to consume less energy, which means to implement energy efficiency policies.

Since than many research and technical efforts were employed to deploy innovative technologies and approaches aimed at reducing energy consumption.

Nowadays energy efficiency is a concept applied all over the world, because many countries, also those with a large availability of natural resources (e.g. natural gas, oil, etc.), realized the importance to preserve their resources, so that they can be exploited for a longer period.

In order to design and implement energy efficiency measures with a specific focus on the buildings sector, it is necessary to train a new generation of engineers "equipped" with specific technical knowledge and transversal managerial skills.

To this scope the MARUEEB Project aims to set up a master courses on "Innovative Technologies in Energy Efficient Buildings" for Russian and Armenian stakeholders. Russian Federation and Armenia have extreme climatic conditions, with very cold winter and hot summer.

They represent a complex case study to approach, therefore engineers are required to have an excellent and up to date knowledge related to energy efficiency measures in buildings.

MARUEEB project by means of a coordinated cooperation among EU universities, Russian universities, Armenian universities and corresponding stakeholders (see Table) aims at proposing innovative and up to date study courses at master level in order to train a new class of engineers and architects with a strong background in the field of energy efficiency in buildings.

The scope of the present paper is to give an overview of the MARUEEB project by introducing its methodology and objects with a specific focus on its development and implementation for Russian Federation.

2. Russian Context

During the last half century, Russia represented a main supplier of primary energy to EU. Similarly, also EU represented a fundamental and reliable partner for Russian Federation, as a neighbor market with half a billion of consumers [2]. This true especially for natural gas, which is a capital intensive business where demand and supply are rigidly connected.

Consortium members of MARUEEB Project

Russian and Armenian HEIs	EU HEIs	Stakeholders
Ural Federal University (RU)	University of Genoa (IT)	Engineering Academy of Armenia (AM)
St. Petersburg State Polytechnic University (RU)	Seconda Università degli Studi di Napoli (IT)	Ministry of Education and Science of Armenia (AM)
Tambov State Technical University (RU)	Slovak University of Technology (SK)	TICASS (IT)
Voronezh State University of Architecture and Civil Engineering (RU)	Technical University of Iasi (RO)	EUCEET (BE)
National Polytechnic University of Armenia (AM)	Kaunas University of Technology (LT)	AE Consulting (AM)
American University of Armenia (AM)		Atomstroykomplex LLC (RU)
MARUEEB Co-funded by the Erasmus+ Programme of the European Union		Center of Construction Expertise R&D (RU)
		Uralproektdubrava (RU)

In the last years new trends emerged on the energy scenario, in terms of demand and supply balance. In particular, EU is pushing towards a transition to a low-carbon energy system and concrete targets have been set for the year 2020 and beyond.

On the other hand, also Russian Federation is on the path to reshape its energy sector by implementing energy efficiency measures which can introduce a high degree of innovation in the sector and concrete targets are established for the year 2030 [2].

The efficient use of energy and an efficient energy supply chain in all sectors of the economy is one of the major pillars of energy and climate policy both in the Russian Federation and the EU. Energy efficiency provides economic, environmental and social benefits which go far beyond the energy sector. In addition to many specific energy policy measures, energy efficiency objectives have a strong impact on other policy areas, notably in transport sector and urban planning. Accordingly, the implementation of energy efficiency policy requires close coordination between many stakeholders and actors, and a well-functioning governance system [2].

The Russian Federation has a very high potential to perform energy savings and implement energy efficiency

measures. In fact, these measures are included in the Energy Strategy of the Russian Federation till 2030 and they are considered one of the priority to pursue the modernization and innovation of the country. A specific target has been also set up, in fact the goal is to reduce energy intensity of the country GDP by 40 % within 2020 with respect to the level of 2007.

The areas which offer the largest potential for energy savings and efficiency are energy supply, namely electricity and heat, buildings and industrial sector [2].

At moment, the main focus of Russia's state policy is on: performance of energy audits, installation of metering devices, energy saving obligations for budgetary organizations, energy efficiency labeling and standards for certain products, revision and adoption of standards for existing and newly-built buildings, energy efficiency promotion [2].

These fields of knowledge and technology offer an immense potential for a close cooperation between the Russian Federation and EU.

For example, the very innovative and strict policies in terms of energy consumption in buildings (e.g. Net Zero Energy Buildings Directive) contributed to the development of high level competences in the developing of energy efficient buildings [3]. Similarly, substantial knowledge has been developed on energy generation and transmission at the urban and community level which could be shared with Russia.

In addition, common activities on energy management, new technology innovations and employment support, including on training activities, could be envisaged. The EU could also support the Russian side in further developing its policy and institutional framework on energy efficiency. Cooperation between local and regional authorities should be strengthened also using existing initiatives [2].

Both sides should aim at developing favorable economic conditions for Russia — EU cooperation in the field of energy efficiency; improving information, technology and best practices exchange; stimulating R&D in the energy efficiency sphere; developing joint programs, feasibility studies and implementation of demonstration projects in energy efficiency sphere; pursuing training projects and work towards approximation of energy efficiency legislation in Russia and the EU [2].

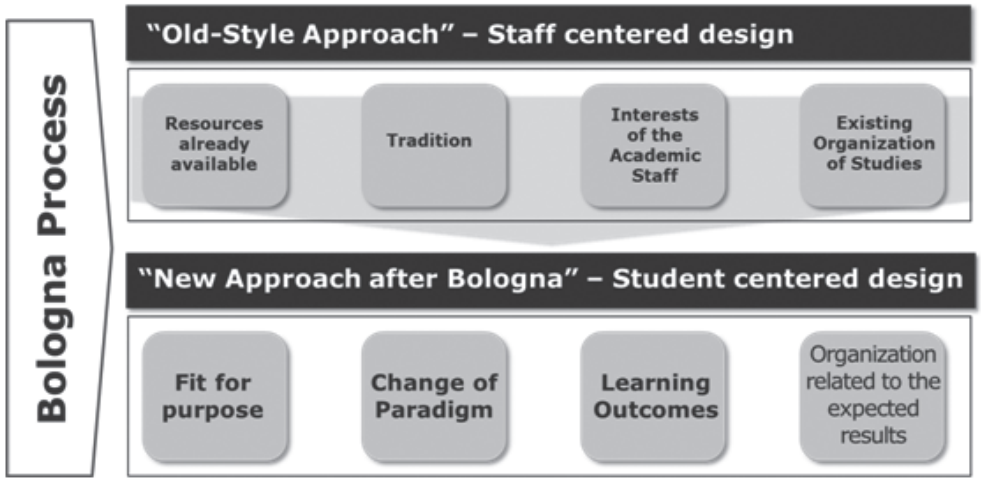
As reported in [2], in the short term, the focus should be on should be on mutual learning and exchange of best practices between the EU and the Russian Federation. To this aim, it seems that an effective way is the cooperation among EU and Russian higher education institutions, in order to implement a transfer of knowledge and to open a debate on the topic in the Russian academic community. In fact, among the recommendations, actions and milestones of the "EU — Russia Energy Cooperation until 2050" [2], there is the necessity of a *"Joint development and carrying out of training/retraining programs for different aspects of energy efficiency (with inclusion in this process of leading engineering higher education institutions of Russia and the EU), including training in energy management sphere"* [2].

3. MARUEEB Project

As reported in the previous section, Russian Federation has an enormous potential to implement energy savings and efficiency measures and they are also supported in the strategic and planning documents of the government, therefore they are at the center of the political, social and economic debates.

For these reasons the partners of the MARUEEB consortium (Table) decided to work on a project related to the design and implementation of four master courses related to energy efficiency in buildings in Russian Universities, namely Ural Federal University, San Petersburg State Technical University, Tambov State Technical University and Voronezh State University of Civil Engineering and Architecture.

The master courses will be implemented in the area of civil engineering and architecture and they have the object to transfer EU best practices in the field of energy efficient buildings and study program development.



Change of paradigm connected with the Bologna Process

The aim of MARUEEB is twofold: from one side there is a strong focus on the engineering and management contents (e.g. building physics, energy efficiency, project valuation, etc.), but, on the other side, aspects linked with the reform of curricula in agreement with the Bologna Process are also emphasized.

In particular, it is highlighted the necessity to move from a "staff centered" approach to a "student centered approach", as reported in Fig.

This change of paradigm requires that the student is at the center of the process for the creation and execution of study programs. This means that activities and teaching modules are developed since they are useful for the students and not for "internal" reasons. In light of this, a close interaction with industrial stakeholders is mandatory, because they will represent the future employers of the students enrolled in the master courses [4].

Student centered approach requires a change of mind set of the academic staff in charge of designing and managing the study programs, in particular the degrees should be organized in terms of the results they intend to achieve, according to their level of education (e.g. bachelor, master, Ph. D.) [4].

At present, many programs are designed on the basis of the "tradition", "available resources" and "interests" of the teaching staff, therefore they can be considered "input based" and "staff centered". In other words, they are focused on the "structure", rather than on the "students".

The transition to a "student centered" approach is a process in place worldwide and it aims at proposing an innovative process of developing educational programs. In particular, the focus is on the fact that the outcomes of the learning process should meet the aims of the program, but also that those outcomes should meet the needs and expectations of students and society, ensuring employment, personal development and citizenship [4].

This highlights the importance of the creation of a positive cooperation and strong relationship between higher education institutions (HEIs) and stakeholders, which become central in the process of developing of the study programs, because they will be the final beneficiaries of the educational and training process.

The importance of the relationship between HEIs and the stakeholders is emphasized in MARUEEB, in fact the first step of the project is represented by a survey among ~100 stakeholders, in order to perform a "needs" analysis to understand which are requests of the business and social communities in the locations of implementations of the master programs.

In this way, it will be possible to tackle in a better way the issues available on the specific context and to frame in an optimal way the programs on the necessities of the local communities. Certainly, more general evaluation based on the national and international trends are also taken into account in the definition of the study programs, in order to give them a national and international dimension.

On the basis of this information, study programs based on learning outcomes will be developed and up to date contents in the field of energy efficiency in buildings will be included.

4. Conclusions

MARUEEB is a project established in the Erasmus+ KA2 framework and it is promoted by a consortium of EU, Russian and Armenian universities and stakeholders.

The consortium is working to develop innovative study programs and teaching modules in the field of energy efficiency in buildings, in order to provide up to date knowledge to Russian and Armenian engineers.

The present paper briefly discusses and analyzes the importance of the development of knowledge related to energy efficient buildings, with specific focus to Russian Federation. In particular, by analyzing the energy strategy of Russian Federation, it is highlighted the central role given to the implementation of energy efficiency measures in the buildings sector and the strategic relevance attributed to the development of study programs in this area.

On the other hand the process must be developed in a modern and effective way, with specific reference to the Bologna Process, which introduced the concept of the "student centered" approach in the design of the study programs. In this framework, the role of external stakeholders is fundamental, because they will result fundamentals in establishing links with the labor market. Their role is considered relevant for the definition of the specific contents of the study courses, in order to be sure that they are relevant for companies and institutions, so that the possibilities to find a job for the graduates are maximized.

Acknowledgment

The MARUEEB project 561890-EPP-1-2015-1-IT-EPPKA2-CBHE-JP, dealing with *"Master Degree in Innovative Technologies in Energy Efficient Buildings for Russian & Armenian Universities and Stakeholders"*, is funded with support from the European Commission, Erasmus+ Porgramme. This info reflects the views only of the authors, and the Commission cannot be held responsible for any use, which may be made of the information contained therein.

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